

REMARKS

Applicants have considered the outstanding official action. It is respectfully submitted that the claims are directed to patentable subject matter as set forth below.

Non-elected claims 1-3 and 15-16 have been canceled. Applicants reserve the right to file divisional applications with respect to the non-elected subject matter.

Claims 5, 7, 12 and 13 are each individually rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

With regard to the rejection of claim 5 under 35 U.S.C. §112, the Examiner states that it is unclear what "surface resistivity" is and what " $\square$ " as a unit represents. Applicants submit that what the symbol  $\square$  represents is clear from the symbol itself. The symbol itself is a square and thus the symbol represents a square. Therefore, surface resistivity as disclosed in the specification has the units of  $\Omega/\square$ , i.e., ohms/square. The captioned application at page 7, lines 15-20, states:

"The electric resistivity of a layer is generally expressed in terms of surface resistivity  $R_s$  (unit  $\Omega$ ; often specified as  $\Omega/\square$ ). Alternatively, the electroconductivity may be expressed in terms of

volume resistivity  $R_v = R_s \cdot d$ , wherein  $d$  is the thickness of the layer, or in units of conductance  $k_i = 1/R_i$  ( $i=s,v$ ; unit=S(iemens)= $1/\Omega$ )."

It is well-known that volume resistivity  $R_v$  has the units  $\Omega$ -cm. In the above quoted passage, it is stated that  $R_v = R_s \times d$ , wherein  $d$  is the thickness of the layer.  $R_s$ , the surface resistivity, has therefore the units of  $\Omega$ , which as stated above is often specified as  $\Omega/\square$ , i.e., ohms/square. Furthermore, at page 7, line 27, to page 8, line 2, unambiguous measurement methods are given to obtain this quantity. Applicants submit that one skilled in the art of resistance measurements would be able to understand and determine surface resistivities. Accordingly, withdrawal of the rejection of claim 5 under 35 U.S.C. §112, second paragraph, is respectfully requested.

With regard to claim 7 and the §112 rejection, the Examiner states that it is unclear what is meant by the "liquid crystal alignment layer is not removed at non-conducting areas" in terms of the structure. Applicants respectfully submit that this language is definite within the meaning of §112. Claim 7 claims that the liquid crystal alignment layer is a patterned layer including conducting and non-conducting areas, and that the crystal alignment layer is not removed at non-conducting areas. Accordingly, the meaning is self-evident. Description of the problem and patterning methods that can be used wherein the

polythiophene is not removed at non-conducting areas is set forth in the specification at page 16, line 26 to page 17, line 13. If the Examiner maintains the §112 rejection of claim 7, the applicants request clarification of why the language is considered indefinite. Withdrawal of the §112 rejection of claim 7 is respectfully requested.

With regard to claim 12 and the §112 rejection, the Examiner states that "it is unclear what the passivating anchor layer is. Is it an adhesive layer? What does it passivate, and what does it anchor?" Applicants have amended claim 12 to claim that the anchor layer is adhesion-improving and that the anchor layer has barrier properties with regard to compounds which may diffuse from the substrate. Withdrawal of the §112 rejection of claim 12 is requested.

With regard to claim 13 and the §112 rejection, the Examiner states that it is unclear where the barrier layer is located, and what it is a barrier against. Claim 13 has been amended to claim "a barrier layer to prevent diffusion of oxygen and/or water vapor through the substrate". In the optional layer configuration disclosed at page 15, lines 17-28, two barrier layers are described, both on the other side of the substrate to the liquid crystal alignment layer. Withdrawal of the §112 rejection of claim 13 is respectfully requested.

The outstanding rejections based on applied art are as follows:

- (1) Claims 4-10, and 14 are rejected under 35 U.S.C. §102(b) as being anticipated by Escher et al (U.S. Patent No. 5,118,538); and
- (2) Claims 6, 7 and 11-14 are rejected under 35 U.S.C. §103(a) over Escher et al in view of Eguchi (U.S. Patent No. 5,465,169).

Initially applicants note that claims 4 and 8 have been amended to define that  $R^1$  and  $R^2$  together represent a  $C_1$ - $C_4$  alkylene group or a cycloalkylene group and to delete where  $R^1$  and  $R^2$  each independently represent hydrogen or a  $C_1$ - $C_4$  alkyl group.

Further, claim 7 has been amended by incorporating the subject matter of claim 6 into claim 7.

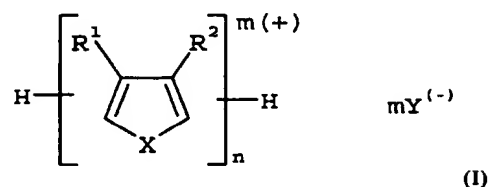
Claim 12 has been amended to be placed in independent form and to define the anchor layer as adhesion-improving and as having barrier properties with regard to compounds which may diffuse from the substrate. Support for the amendment can be found in the specification at page 14, lines 2-7.

Claim 13 has been amended to state that the substrates are provided with a barrier layer to prevent diffusion of oxygen and/or water vapor through the substrate. Support for the amendment can be found in the specification at page 15, lines 6-8.

With regard to the rejection of claims 4-10 and 14 under 35 U.S.C. §102(b), the Examiner states "Escher et al. has a liquid crystal display where the alignment layer (orienting) is in direct electrical contact with the associated electrode. The electrically conductive polymer which comprises the alignment layer is a polythiophene of the formula" (II) as set forth at column 2, lines 40-52. The Examiner further states that "Escher et al. teaches that the electrically conductive polymer is coated onto a glass substrate provided with a transparent electrode (column 5, lines 20-50). Since the associated electrodes are discrete elements, the alignment layer will have conducting areas where it is in direct electrical contact with the associated electrode, and will have nonconducting areas in between the electrodes. Since the electrically conductive polymer has a specific conductance of at least  $10^{-5}$  Siemens (column 3, lines 30-40), the examiner has taken the position that the alignment layer has surface resistivity of the claimed amount".

Escher et al teaches at column 2, lines 4+, a liquid-crystal switching and display element containing a ferroelectric liquid-crystalline medium, two electrodes, at least one polarizer, two transparent carrier plates and at least one orienting layer, wherein at least one of the orienting layers is in direct electrical contact with the

associated electrode and the orienting layer contains an electrically conductive polymer of the formula (I):



where  $\text{R}^1$ ,  $\text{R}^2$  are, independently of each other, H, or straight-chain or branched alkyl or alkoxy containing 1-16 carbon atoms, or halogen; X is sulfur or NH; Y is  $\text{BF}_4^-$ ,  $\text{PF}_6^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{AsF}_6^-$ ,  $\text{SbCl}_6^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{HSO}_4^-$ , alkyl- $\text{SO}_3^-$ , perfluoroalkyl- $\text{SO}_3^-$ , aryl- $\text{SO}_3^-$ ,  $\text{F}^-$  or  $\text{Cl}^-$ ; n is an integer from 4 to 100; and m is an integer from 1 to 30.

As set out above, claims 4 and 8 have been amended to delete where  $\text{R}^1$  and  $\text{R}^2$  do not together represent a  $\text{C}_1$ - $\text{C}_4$  alkylene group or a cycloalkylene group. Escher et al do not disclose polythiophenes according to formula (I) in which  $\text{R}^1$  and  $\text{R}^2$  together form an O- $[\text{C}_1$ - $\text{C}_4$  alkylene]-O group or a O-[cycloalkylene]-O group. Applicants submit, therefore, that Escher et al do not teach each and every element of the claimed invention and that amended claims 4-10 and 14 are novel over Escher et al. Withdrawal of the rejection under 35 U.S.C. §102(b) is respectfully requested.

With regard to the rejection of claims 6, 7 and 11-14 under 35 U.S.C. §103(a) over Escher et al in view of Eguchi, the Examiner asserts that

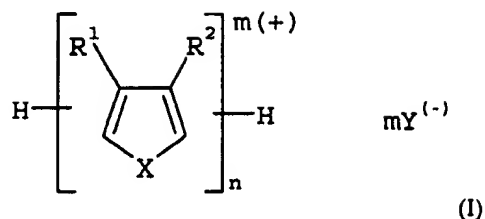
"Escher et al. teaches the liquid crystal display with the polythiophene alignment layer with the specific claimed formula. Escher et al. however fails to teach that the electroconductive layer (electrode) is made out of indium tin oxide, the passivating anchor layer, and the barrier layer. Eguchi et al. teaches a liquid crystal display where the alignment layer may be provided with an electroconductivity selectively at parts above the electrode is as to provide an improvement in prevention of crosstalk between pixels (abstract). The substrate is provided with an electroconductive barrier (protective) layer (film), and also an alignment layer (film comprising an alignment material and a polymeric electroconductive compound. The polymeric electroconductive compound in the alignment layer is disposed selectively on the part having the electrode (column 3, lines 40-60) thus forming a pattern of conducting areas on the part above the electrode, and leaving the other areas of the alignment layer non-conducting. The transparent electrodes are taught to be indium tin oxide (column 5, lines 10-35). The polymeric electroconductive compound is taught to be

polythiophene and derivatives thereof (column 5, lines 55-68).

Although Eguchi et al. fails to teach a passivating anchoring layer between the substrate and the alignment layer, using an adhesive layer to adhere the substrate to the alignment layer in liquid crystal display is well known in the art.

Because Eguchi et al. teaches that providing a liquid crystal display with an electroconductivity selectively at parts above the electrode prevents crosstalk between pixels, it would have been obvious to one of ordinary skill in the art to have used the patterned alignment structure and the associated barrier layer of Eguchi et al. and the alignment layer structure and associated barrier layer in the invention of Escher et al. in order to obtain a liquid crystal display with decreased crosstalk between pixels."

Escher et al teaches a liquid-crystal switching and display element containing a ferroelectric liquid-crystalline medium, two electrodes, at least one polarizer, two transparent carrier plates and at least one orienting layer, wherein at least one of the orienting layers is in direct electrical contact with the associated electrode and the orienting layer contains an electrically conductive polymer of the formula (I):



where  $\text{R}^1$ ,  $\text{R}^2$  = are, independently of each other, H, or straight-chain or branched alkyl or alkoxy containing 1-16 carbon atoms, or halogen; X is sulfur or NH; Y is  $\text{BF}_4^-$ ,  $\text{PF}_6^-$ ,  $\text{PO}_4^{3-}$ ,  $\text{AsF}_6^-$ ,  $\text{SbCl}_6^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{HSO}_4^-$ , alkyl- $\text{SO}_3^-$ , perfluoroalkyl- $\text{SO}_3^-$ , aryl- $\text{SO}_3^-$ ,  $\text{F}^-$  or  $\text{Cl}^-$ ; n is an integer from 4 to 100; and m is an integer from 1 to 30.

With respect to the rejection of claims 6-7, 11, 13 and 14, Escher et al do not disclose polythiophenes according to formula (I) in which  $\text{R}^1$  and  $\text{R}^2$  together form an O-[C<sub>1</sub>-C<sub>4</sub> alkylene]-O group or a O-[cycloalkylene]-O group. Escher et al disclose at column 4, lines 47-61, that owing to its good orienting properties (good planar orientation) and its high electrical conductivity, the use of a polymer of the formula (III), poly(3-methoxythiophene) with a degree of polymerization of 5 or 6 and  $\text{BF}_4^-$  counterions, has proved particularly advantageous for orienting layers in displays. However, Escher et al provides no teaching or suggestion that poly(3,4-alkylenedioxythiophene)'s provide good liquid crystal orienting properties regardless of the degree of polymerization.

Eguchi teaches at column 3, lines 40-47, a liquid crystal device comprising a pair of substrates which have an electrode thereon and a liquid crystal disposed between the substrates, wherein at least one of the substrates is provided with an electroconductive protective film and also an alignment film comprising an alignment material and a polymeric electroconductive compound. Eguchi distinguishes between the presence of an alignment material and of a polymeric electroconductive compound in the alignment film. Further, Eguchi exemplifies polyimide liquid crystal alignment materials and polyaniline, polypyrrole and poly-2,5-thienylene vinylene polymeric electroconductive compounds.

With regard to claim 6 and amended claim 7, locally enhanced electroconductivity, for example effected by ionic dopants, as disclosed in Eguchi is not feasible for poly(3,4-alkylenedioxythiophene)'s. Applicants submit that a combination of Escher et al and Eguchi neither teaches the inventions of claims 6, 7, 11, 13 and 14 nor provide one skilled in the art with a suggestion regarding providing the claimed invention. Claim 6 and amended claim 7, both depend from amended claim 4; claim 11 and amended claim 13 depend from amended claim 8; and claim 14 depends alternatively on claim 4 or 8, are thus submitted not to be obvious within the meaning of 35 U.S.C. §103(a) over Escher et al in view of Eguchi.

With regard to the rejection of independent claim 12 under 35 U.S.C. §103(a) over Escher et al in view of Eguchi, Eguchi distinguishes between the presence of an alignment material and of a polymeric electroconductive compound in the alignment film and Eguchi exemplifies polyimide liquid crystal alignment materials and polyaniline, polypyrrole and poly-2,5-thienylene vinylene polymeric electroconductive compounds.

The Examiner concedes that a combination of Escher et al and Eguchi does not teach a passivating anchor layer between a substrate and an adjustment layer as claimed in claim 12. However, the Examiner asserts that "using an adhesive layer to adhere the substrate to the alignment layer in liquid crystal display is well known in the art." Applicants', however, submit that even assuming the Examiner is correct that use of an adhesive layer to adhere a substrate to an alignment layer in a liquid crystal display is well known in the art, the use of an adhesion-promoting layer which has the additional property of having barrier properties with regard to compounds which may diffuse from the substrate is not known to one skilled in the art. Claim 12 has been amended to be placed in independent form and claim that the anchor layer is adhesion-improving and has barrier properties with regard to compounds which may diffuse from the substrate. The anchor layer is provided between at least one of the substrates and the liquid

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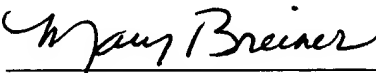
crystal alignment layer. Accordingly, the invention of claim 12 is patentable under 35 U.S.C. §103(a) over Escher et al in view of Eguchi. The applied art does not render the claimed invention obvious within the meaning of §103.

Withdrawal of the §103 rejection as to claims 6, 7 and 11-14 is respectfully requested.

Reconsideration and allowance is respectfully urged.

Respectfully submitted

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